Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Water Entry of Deformable Spheres TATE FANNING, RANDY HURD, Brigham Young University, JESSE BELDEN, Naval Undersea Warfare Center, TADD TRUSCOTT, Brigham Young University — We examine the water entry characteristics and cavity dynamics of highly deformable elastic spheres at high Reynolds numbers (10^5) using high-speed photography and image processing techniques. Upon impact normal to a free surface, these elastic spheres undergo significant deformation. We have observed principal stretches on the order of 1.6 diameters for the most compliant spheres. This initial deformation sets up an oscillatory vibration mode in the sphere that persists throughout its descent through the water column. These oscillations disturb normal cavity formation, resulting in the formation of a periodic, nodular cavity. A comprehensive experimental study allows for prediction of cavity shape, pinch off depth, and time to pinch off. Decreasing sphere stiffness results in decreased pinch off depths, and increased time to pinch off over the range of Reynolds numbers tested.

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Date submitted: 31 Jul 2014 Electronic form version 1.4